

What is claimed is:

1        1. A method for reducing copper corrosion in a semiconductor device  
2 comprising:  
3            providing a semiconductor substrate with a Cu-containing conductive material  
4 formed thereon and a film directly interposed between said Cu-containing conductive  
5 material and the environment; and  
6            cleaning said semiconductor substrate using a DI water clean operation that  
7 includes rotating said semiconductor substrate at a spin speed no greater than 350 rpm.  
8

1        2. The method as in claim 1, wherein said providing includes performing an  
2 etch operation that exposes said film and includes using a patterned photoresist layer  
3 as an etch mask, and said cleaning said semiconductor substrate further comprises  
4 removing portions of said photoresist layer.

1        3. The method as in claim 2, wherein said cleaning said semiconductor  
2 substrate further comprises stripping said photoresist layer using a plasma prior to said  
3 using a DI water clean operation.

1        4. The method as in claim 1, wherein said film comprises an etch stop film  
2 and said providing comprises performing an etch operation that exposes said etch stop  
3 film.

1        5. The method as in claim 4, wherein said performing an etch operation  
2 comprises etching a dielectric layer formed over said etch stop film.

1        6. The method as in claim 5, wherein said etch stop film is disposed directly  
2 beneath said dielectric layer.

1           7.       The method as in claim 5, wherein said etching a dielectric layer is part of  
2 a dual damascene dry etching process sequence.

1           8.       The method as in claim 5, wherein said dielectric layer includes at least  
2 one of a layer of carbon-containing material, a layer of nitrogen-containing material and  
3 a layer of fluorine-containing material.

1           9.       The method as in claim 1, wherein said Cu-containing conductive material  
2 comprises substantially pure copper.

1           10.      The method as in claim 1, wherein said film comprises one of SiN, SiC,  
2 SiOC, and SiCN.

1           11.      The method as in claim 1, wherein said film includes a thickness ranging  
2 from 400 to 800 angstroms.

1           12.      The method as in claim 1, wherein said cleaning includes rotating said  
2 semiconductor substrate at a spin speed of at least 150 rpm during said DI water clean  
3 operation.

1           13.      The method as in claim 1, wherein said semiconductor substrate is  
2 approximately 300mm in diameter and said spin speed lies within the range of 180 to  
3 250 rpm.

1           14.      The method as in claim 1, wherein said semiconductor substrate is  
2 approximately 200 mm in diameter and said spin speed lies within the range of 200 to  
3 300 rpm.

1           15.      The method as in claim 1, wherein said cleaning further includes cleaning  
2 said semiconductor substrate using an in-situ organic cleaning operation, an aqueous

3 chemical cleaning operation or a DI water/ozone cleaning operation, prior to said using  
4 a DI water clean operation.

1 16. The method as in claim 15, wherein said in-situ organic cleaning  
2 operation, aqueous chemical cleaning operation or DI water/ozone cleaning operation  
3 comprises an organic cleaning operation using an organic solvent that contains fluorine.

1 17. The method as in claim 1, further comprising performing an in-situ drying  
2 operation by spin drying said semiconductor substrate.

1 18. The method as in claim 17, wherein said spin drying includes air or  
2 nitrogen as a gaseous medium.

1 19. The method as in claim 1, wherein said DI water clean operation includes  
2 nitrogen or air as an ambient medium.

1 20. The method as in claim 1, wherein said cleaning comprises individually  
2 cleaning said semiconductor substrate in a tool that processes semiconductor  
3 substrates individually.